

**PROGRAM RESEARCH & DEVELOPMENT ANNOUNCEMENT**

00-03-PRK

**TABLE OF CONTENTS**

**1. Announcement**

**Introduction**

**Section A: Statement of Problem/Objective**

**Section B: Current Proposal Topics**

**Section C: Award Information**

**Section D: Proposal Preparation Instructions**

**Section E: Basis for Award**

**Section F: Other Information to Offerors**

**2. Contract Data Requirements List (CDRL)**

**CBD ANNOUNCEMENT NR: Program Research and Development  
Announcement (PRDA) NR: 00-03-PRK**

**TITLE:** POWER TECHNOLOGIES FOR AIR, SPACE AND WEAPONS

**TECHNICAL POC:** John Nairus, AFRL/PRPE, phone (937) 255-9392, e mail: John.Nairus@wpafb.af.mil; mail address: AFRL/PRPE, Bldg 18, 1950 Fifth St., Wright-Patterson AFB, OH 45433-7251

**CONTRACTING POC:** Chris Lay, AFRL/PRKA, (937) 255-8077, e mail: Christina.Lay@wpafb.af.mil; Mail address: AFRL/PRKA, Bldg 167, 2310 8th St., Wright-Patterson AFB, OH 45433-7801

**PROPOSAL DUE DATE AND TIME:** 18 Dec 00, 3:00 P.M. local time. **NOTE:** *Proposal receipt after the due date and time shall be governed by the provisions of FAR 52.215-1(c)(3). Proposals should be addressed to the Contracting Point of Contact (POC) stated above.*

**INTRODUCTION:**

The Power Division of the Air Force Research Laboratory Propulsion Directorate (AFRL/PRP) is soliciting proposals under this Program Research and Development Announcement (PRDA) to develop, demonstrate and improve upon key power technologies supporting Air, Space and Weapon applications in the areas of Power Generation, Power Conditioning & Distribution, Energy Storage, and Subsystem Integration. The technical improvements in these four areas will contribute toward meeting the Power Division's goals in the 2005 and beyond timeframe, and goals deemed necessary to facilitate nearer-term transition or transfer.

Power technologies for aircraft support the integrated goals of the joint DoD/NASA/Industry More Electric Initiative. More electric technologies significantly increase manned airborne weapon system reliability, while greatly decreasing life cycle and maintenance costs and enabling 10-20 year long-term storage requirements of uninhabited air vehicles (UAV). Aircraft improvements include reduced vulnerability, reduced weight, and increased range. These improvements are realized by aircraft relying more heavily on electrical power generation and distribution to perform tasks normally accomplished by hydraulic, mechanical, or pneumatic techniques. Advanced power technologies also support the initiative to develop directed energy weapons and place these weapons on airborne platforms. The airborne use of directed energy weapons is driving the onboard electrical power requirements beyond the limits of conventional electrical power and thermal management systems and has driven the need to develop the necessary

power generation, distribution and conditioning technologies required for the airborne use of these weapons. Power technologies for space applications develop innovative technologies to reduce spacecraft size and weight, increase efficiency, increase operational life and develop affordable spacecraft.

The over arching strategy of the PRDA involves the use of a 3-year open-ended solicitation spanning the four major technology areas of Power Generation, Power Conditioning and Distribution, Energy Storage and Subsystem Integration for Air, Space, and Weapon applications. This strategy will give AFRL/PRP an acquisition tool with the flexibility to solicit proposals and make awards to develop technologies to meet present and future Air Force needs real-time as ever-changing technology issues are identified. Although the PRDA will remain "open" for 3 years, proposals will only be solicited and accepted during "calls". Each call will list solicitation topics and contain a common cut-off date for proposal submission. *Proposal receipt after the specified due date and time shall be governed by the provisions of FAR 52.215-1(c)(3).* The first call for proposals will occur with the issuance of this PRDA (see Section B for current proposal topics).

Subsequent calls for proposals (made by amendments to the solicitation) will occur at approximately 6-12 month intervals. Each call will: (1) identify specific technology development topics within the four major technology areas (Power Generation, Power Conditioning and Distribution, Energy Storage, and Subsystem Integration); (2) identify any changes to the evaluation criteria or proposal preparation instructions, and; (3) contain new common cutoff dates for proposal submissions. *Proposal receipt after the specified due date and time shall be governed by the provisions of FAR 52.215-1(c)(3).*

Throughout the life of the solicitation, awards will be made in the form of assistance instruments (i.e., Grants, Cooperative Agreements or Other Transactions) and cost type contracts that may be Cost Reimbursement, Cost Sharing, Cost-Plus-Fixed-Fee, or Indefinite Delivery/Indefinite Quantity (ID/IQ) contracts. Although ID/IQ awards may occur within the life of the program for technology integration efforts and studies, the PRDA will also be used to award technology development programs directly to individual technology suppliers. In the event ID/IQ proposals are requested, the tasks to be included in the ID/IQ contracts will be in the nature of, but not limited to, system/subsystem integration activities or studies/analyses of the technology issues within any of the four major technology areas. The ordering period for any ID/IQ contract(s) may exceed the 3-year open PRDA announcement.

To stimulate and maintain potential offerors' interest throughout the program, the government team will establish and maintain an informational site on the Aeronautical Systems Center's (ASC) Pre-award Information

eXchange System (PIXS) web page: <http://www.pixs.wpafb.af.mil>. The site will include a copy of the initial PRDA, updates on anticipated amendments, copies of all amendments issued, and other items of interest to potential offerors. The target date for establishing the site is 30 Nov 2000. **This site will supplement, not replace, official notices in the CBD and Central Posting System (CPS).**

**Each call for proposals will identify specific topics in Section B. Proposals should be addressed to the Contracting Point of Contact (POC) stated above.** This is an unrestricted solicitation. Small businesses are encouraged to propose on all or any part of this solicitation. Proposals submitted shall be in accordance with this announcement. Offerors should be alert for any PRDA amendments that may permit extensions to the proposal submission date stated above.

Potential offerors are notified that effective 01 Jun 1998, in order to be eligible to receive any DOD award, contractors must be registered in the Central Contractor Registration (CCR) Database, unless a contractor meets any of the exceptions of DFARS 204.7302. On-line registration instructions can be accessed from the Wright Research Site Contracting Office home page at <http://www.wrs.af.mil/contract/> or the DISA CCR home page at <http://www.ccr2000.com/>

### **SECTION A: Statement of Problem/Objective:**

**1. Statement of Objective/Needs:** The objectives of power technology development for air, space and weapon applications will be met by technical achievements in four areas: Power Generation, Power Conditioning & Distribution, Energy Storage, and Subsystem Integration.

**a. Research and development in the Power Generation area will demonstrate technologies for electrical power generation for aircraft and weapons applications. Increasing capabilities over present technology on existing aircraft, integrating power generation into the turbomachine, and affordable manufacturability are key focus areas. Existing aircraft have restrictive limits on the amount of power available for advanced sensors and weapons. Auxiliary or primary generator technologies providing 30-100KW additional power are desired for sustainment applications such as advanced avionics upgrades. Future aircraft can benefit from starter/generators built into the main engine. Full scale characterization and attendant technologies are required. Examples of supporting technologies include, but are not limited to, high temperature wire insulation, modeling of mechanical and magnetic behavior, sensorless algorithms and advanced control methodologies. An integrated power unit with a high temperature**

**superconducting generator and attendant technologies are also desired for high power directed energy weapon applications. Directed energy applications will require power sources rated from a few hundred kilowatts to several megawatts.**

**b. Research and development in the Power Conditioning and Distribution components and systems goals are aimed at demonstrating increased reliability, temperature capability, power density, efficiency, and fault tolerance for power conditioning, power management and distribution components and systems. Component technologies include, but are not limited to, solid state switching devices, magnetic devices, capacitors and energy conversion devices. System technologies include, but are not limited to, advanced inverters, converters and controllers for motors, starter/generators, integrated power units, and magnetic bearing systems. The power conditioning and distribution component and system technologies will be developed for a wide range of applications including ground, aircraft, spacecraft (ie: distributed power conditioning) and directed energy (pulsed and continuous) power systems.**

**c. Energy Storage research and development will focus on increased energy density, high power capability, long cycle life and improved temperature range performance for rechargeable battery technologies such as lithium ion and lithium polymer. Smart charger technology will enhance battery performance and life in energy storage systems ranging in voltages from 28 to 270 volts. Advanced thermal battery component development will extend active run-time and reduce weight for applications such as tactical missiles and aircraft emergency power. High energy, high power fuel cell developments will improve efficiency and develop reformer technology for propulsion and payload power for long duration mission requirements needed for UAVs. Battery/capacitor hybrids are also of interest for high-rate applications.**

**d. Subsystem Integration research and development will enhance and demonstrate reliability and power density benefits through specific integration demonstrations and/or simulations. This will include both on-board power and special purpose directed energy weapon power when operated in extreme environments, such as space. Thermal management technologies for spacecraft are required for reduced cost, size and weight of power systems with ever-increasing power levels. Improved diagnostics for evaluation of insulation system integrity, both on and off line, are necessary for electrical power equipment operation at sub-atmospheric pressures. Development of high pulsed voltage, high pulsed current devices are necessary for both advanced insulation diagnostics and directed energy weapon operation. Variable delivery fuel pump technology offering reduced aircraft thermal load is required for advanced fighter aircraft. Advanced cooling techniques (ie: high flux heat transfer) are also required to**

**implement directed energy weapons and high power electronics on aircraft or spacecraft. Electromagnetic interactions between on-board vehicle power and pulsed directed energy weapon operation must be characterized by demonstrations which will lead to verifiable advanced modeling techniques to predict system performance and enhance overall reliability.**

**2. Deliverable Items (applies to total program):**

**a. Data Items:**

- **Presentation Materials (as requested, DI-ADMN-81373/T)**
- **Status Reports (Monthly, DI-MGNT-80368/T)**
- **Funds and Manhour Expenditure Reports (Monthly, required, DI-FNCL-80331/T)**
- **Scientific and Technical Reports: Contractor Billing Voucher (Monthly, required, DI-MISC-80711/T)**
- **Scientific and Technical Reports: Final Report (One required, DI-MISC-80711/T)**
- **Other data items should be proposed, as appropriate**

**b. Software/Hardware (applies to total program): All deliverables should be clearly identified. Rights desired for software/hardware delivered under the proposal are Unrestricted/Unlimited.**

**3. Schedule (applies to total program): Overall efforts will vary between 12 to 60 months (inclusive of final report preparation). Awards are anticipated beginning February 2001.**

**4. Other Requirements (applies to total program)**

**a. Classified: None anticipated, but SECRET FACILITY AND STORAGE CLEARANCE MAY BE REQUIRED AND APPROPRIATE CLEARANCE SHOULD BE PROPOSED BY OFFEROR. If classified will apply to the performance of the effort, the proposal should discuss appropriate personnel and facility clearances.**

**b. International Traffic in Arms Regulations (ITAR) (export control) may apply.**

**c. PL 98-94 (export control) may apply.**

**d. Government Furnished Property (GFP)/Base Support: None anticipated. Proposal must identify if any is required/requested.**

**e. Associate Contractor Provision may apply.**

f. Organizational Conflict of Interest Provision may apply.

## **SECTION B: Current Proposal Topics**

Five individual topics have been identified for this initial announcement. *Each topic will be evaluated separately* using the evaluation criteria specified in Section E. Offerors that propose on more than one topic must submit a separate, stand-alone technical and cost proposal for EACH topic. All proposals are due not later than (NLT) the common cut-off date specified at the beginning of the announcement. The Government anticipates *one award per topic* (5 individual awards for the initial topics) but reserves the right to select for award any, all, part or none of the proposals received. Awards from the initial topics are anticipated to be either a CPFF (Completion) contract or an assistance instrument, but the government reserves the right to use other types of cost contracts.

The first five proposal topics include:

**A. Magnetic Bearing for Cooling Turbines:** Design/develop/demonstrate an aircraft integrated turbo-machine subsystem incorporating magnetic bearings that is used to provide augmented cooling and electrical power for aircraft applications, such as for the F-16. Fabricate and test development hardware to verify performance; develop/implement transition plan. Feasibility studies for applying this technology to directed energy weapon (electric/cooling loads) for aircraft application is highly encouraged.

Anticipated Funding: FY 01 \$2.8M (fully funded with FY01 funds)  
Anticipated Period of Performance: 12 months

**B. Variable Displacement Vane Pump (VDVP):** Develop a highly-efficient, fully variable-displacement fuel pump that can meet the anticipated flow variations and peak fuel flow demand of an advanced tactical aircraft's propulsion engine. Fuel displacement from the pump should sufficiently match to varied engine fuel flow demands, so to minimize fuel return and waste heat to the fuel tankage throughout an anticipated tactical aircraft mission. The fuel flow variance is expected to be as much as 90% less at idle speed than from peak flow for takeoff thrust, but expected pump drive variation should be no more than 20%. Fabricate the pump and perform endurance and damage tolerance tests to help initiate flightworthy qualification. Revise the pump hardware as necessary to allow for installation onto a propulsion engine for ground-based tests.

Anticipated Funding: FY 01 \$1.5M (fully funded with FY01 funds)  
Anticipated Period of Performance: 12 months

**C. PBO Fuel Cell Membrane:** Design and fabricate a Poly(p-phenylene-2, 6-benzobisoxazole) (PBO) membrane for use in Proton Exchange Membrane (PEM) fuel cells; specifically directed for methanol fuel cells. Perform physical and electrochemical characterization of the membranes. Conduct preliminary performance evaluation in a direct methanol fuel cell.

**Anticipated Funding: FY 01 \$1.7M (fully funded with FY01 funds)**  
**Anticipated Period of Performance: 12 months**

**D. Lithium Ion Batteries:** Design, fabricate, and test lithium ion cells for battery applications. Potential applications include high rate, high power, and low temperature.

**Anticipated Funding: FY 01 \$430K (fully funded with FY01 funds)**  
**Anticipated Period of Performance: 12 months**

**E. Advanced Motor Drive:** This effort is a study consisting of two phases that may or may not run concurrently. The first phase of the study is to perform a benefits assessment of achieving the More Electric Aircraft (MEA) Generation II goals for motor drives. By definition for this PRDA, the motor drive includes the motor, power electronics, and control electronics. The MEA Generation II power density goals are based on "real" MEA application of the motor drive. The benefits assessment should quantify system level (aircraft) impacts of using MEA Generation II motor drive for a wide variety of applications, including but not limited to flight control actuation and utility actuation. The second phase of the study will be a conceptual design. The study will identify key component technologies that must be developed or improved in order to demonstrate MEA Generation II motor drive goals by the year 2005. The study must accomplish several conceptual designs of MEA Generation II motor drives for various applications. The study must also identify detailed approaches to component improvement and development that must be matured in order to demonstrate MEA Generation II motor drives by the year 2005.

**Anticipated Funding: FY 01: \$300K    FY02: \$200K**  
**Anticipated Period of Performance: 18 months**

***The funding profiles outlined above for each topic are estimates only and not a promise for funding as all funding is subject to change due to Government discretion and availability. The government reserves the right to make multiple awards or no awards in any one topic.***



## **SECTION C: Award Information**

1. **Expected Award Date:** Initial awards (anticipate 5 in FY01) beginning 28 Feb 2001. Additional awards probable based on amendments issued during the 3-year (FY01-FY03) solicitation.
2. **Anticipated funding for the program (not per contract):** FY01: \$10590M  
FY02: \$11864M    FY03: \$14063M    FY04: \$13331M    ***This funding profile is an estimate only and is not a promise for funding as all funding is subject to change due to Government discretion and availability.***
3. **Type of Contract/Instrument (applies to total program):** Cost Plus Fixed Fee (Completion), Cost (no fee), Cost Sharing, Indefinite Delivery/Indefinite Quantity (ID/IQ), Grants, Cooperative Agreements, or Other Transactions. The Air Force reserves the right to award a contract or assistance instrument. See [Section D](#) below.
4. Multiple awards are anticipated, but the government reserves the right to award to one source.

## **SECTION D: Proposal Preparation Instructions**

1. **General Instructions:**
  - a. Offerors should apply the restrictive notice prescribed in the provision of FAR 52.215-1(e) Instructions to Offerors--Competitive Acquisition. Offerors should consider proposal instructions contained in the AFRL [PRDA/BAA Guide for Industry](#), which can be accessed on line at [www.wrs.afrl.af.mil/contract](http://www.wrs.afrl.af.mil/contract). This guide was specifically designed to assist offerors in understanding the PRDA/BAA proposal process. Technical/management and cost volumes should be submitted in separate volumes, and must be valid for 180 days. Proposals must reference the above announcement number. **Offerors must submit one original, 2 copies and one electronic copy of their proposals. The electronic copy must be a Microsoft Word document for the technical and business portion and Microsoft Excel for the cost portion of the proposal.** ***Offerors are advised that only contracting officers are legally authorized to contractually bind or otherwise commit the government. The cost of preparing proposals in response to this PRDA is not considered an allowable direct charge to any resulting or any other contract; however, it may be an allowable expense to the normal bid and proposal indirect cost as specified in FAR 31.205-18.***

b. **Notice to Foreign-Owned Firms:** Such firms are asked to immediately notify the [Contracting POC](#) cited above before deciding to respond to this announcement. Foreign contractors should be aware that restrictions might apply which could preclude their participation in this acquisition.

This acquisition may involve data that are subject to export control laws and regulations. A foreign disclosure review of the technical data has not yet been accomplished. If the review determines that data are subject to export controls, only contractors who are registered and certified with the Defense Logistics Services Center (DLSC) shall be provided copies of data subject to foreign disclosure restrictions. Contact the Defense Logistics Services Center, 74 Washington Avenue N., Battle Creek, Michigan 49917-3084 (1-800-352-3572) for further information on the certification process. You **must** submit a copy of your approved DD Form 2345, Military Critical Technical Data Agreement, with your proposal.

## **2. Technical/Management Proposal:**

a. **Page Limitation:** 35 pages, 10 pitch or larger, double spaced, single-sided, 8.5 by 11 inches. This limitation includes all information, e.g., indices, photographs, foldouts, appendices, attachments, etc. It does not apply to the offeror's proposed Statement of Work (SOW), which is limited to 5 pages. **The government will not consider pages in excess of this limitation.**

b. The proposal shall include a discussion of the nature and scope of the research and the technical approach. Additional information on prior work in this area, descriptions of available equipment, data and facilities and resumes of personnel who will be participating in this effort should also be included as attachments to the technical proposal. This volume shall include a SOW detailing the technical tasks proposed to be accomplished under the proposed effort and suitable for contract incorporation. **Do not include any proprietary information in the SOW.** Refer to the [AFRL PRDA/BAA Guide for Industry](#) referenced above to assist in SOW preparation.

c. Any questions concerning the technical proposal or SOW preparation shall be referred to the [Technical POC](#) cited above.

## **3. Cost/Business Proposal:**

Separate the proposal into a business section and cost section. **Adequate price competition is anticipated.** The business section should contain all business aspects to the proposed contractual or

instrument arrangements, such as type of contract/instrument, any exceptions to terms and conditions of the announcement, any information not technically related, etc. Provide rationale for exceptions. If selected for negotiations, qualifying offerors may be required to submit a subcontracting plan. Cost proposals have no limitations; however, offerors are requested to keep cost proposals to 20 pages as a goal. The proposal shall be furnished with supporting schedules and shall contain a personhour breakdown per task. Refer to the [AFRL PRDA/BAA Guide for Industry](#) for detailed proposal instructions.

### **SECTION E: Basis for Award**

The selection of one or more sources for award will be based on an evaluation of each offeror's proposal (both technical and cost/price aspects) to determine the overall merit of the proposal in response to the announcement. The technical aspect, which is ranked as the first order of priority, shall be evaluated based on the following criteria that are of equal importance:

#### **TECHNICAL:**

- a. New and creative solutions that clearly demonstrate technical or scientific merit and are highly relevant to Air Force needs.
- b. Impact of successful development on advancing technology for air, space, and/or weapon power applications.
- c. Soundness of offeror's technical approach, including proposed Statement of Work (SOW).
- d. The offeror's past experience with the technology, including personnel and related facilities.

**COST/PRICE:** Cost/Price proposals will be evaluated using the following criteria: reasonableness and realism of the proposed cost and fee and consideration of proposed budgets and funding profiles. Cost/Price is a substantial factor, but ranked as the second order of priority.

***Proposal Risk Assessment:*** Proposal risk will be individually assessed for the technical, cost and schedule areas. Proposal risk relates to the identification and assessment of the risks associated with an offeror's proposed approach as it relates to accomplishing the proposed effort. Tradeoffs of the assessed risk will be weighed against the potential payoff.

No other evaluation criteria will be used. The technical and cost proposals will be evaluated at the same time. The Air Force reserves the right to select for award of a contract or assistance instrument any, all, part or none of the proposal received. Award of a grant to universities or nonprofit institutions, or assistance instrument in lieu of a contract will be subject to the mutual agreement of the parties. The government also reserves the right to award any resulting contract pursuant to the Research and Development Standard Contract format in DFARS 235.70.

#### **SECTION F: OTHER INFORMATION TO OFFERORS:**

a. An Ombudsman has been appointed to hear concerns from offerors or potential offerors during the proposal development phase of this acquisition. The purpose of the Ombudsman is not to diminish the authority of the program director or Contracting Officer, but to communicate Contractor concerns, issues, disagreements, and recommendations to the appropriate government personnel. When requested, the Ombudsman shall maintain strict confidentiality as to the source of the concern. The Ombudsman does not participate in the evaluation of proposals or in the selection decision. Interested parties are invited to contact Lt. Col. Sam A. Lopez, AFRL/PK, telephone (937) 255-4813, e-mail [sam.lopez@wpafb.af.mil](mailto:sam.lopez@wpafb.af.mil) . All routine communication concerning this acquisition should be directed to SUSAN L. DAY, Contracting Officer, telephone (937) 255-5499.

b. Based upon market research, the Government is not using the policies contained in Part 12, Acquisition of Commercial Items, in its solicitation for the described supplies or services. However, interested persons may identify to the contracting officer their interest and capability to satisfy the Government's requirement with a commercial item within 15 days of this notice.